THE OPERATIONAL AND ECONOMIC VALUE OF REMOTE MONITORING OF PRODUCTION OPERATIONS

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Remote monitoring is distinct from more complex and expensive distributed control systems in its focus on providing visibility to the data rather than autonomous control of oilfield processes. Several of the underlying components are similar in name and function though the goals are different. Remote monitoring of production operations outside of supermajors and large independents is still in its infancy. Despite this fact many independents have enjoyed significant economic and operational value from early adoption of the technology. We'll use several case studies to highlight their results.

One of the core concepts of remote monitoring in an oil and gas operation is pumping by exception. This term was coined by the supermajors several years ago to describe the practice of lease operators only visiting sites when they know work is required (in other words by exception). In most cases on most days the remote monitoring system collects the routine production data the lease operator would otherwise have been responsible for. The system also analyzes the production data and reports any departure from expected performance to alert the lease operator that a site visit is needed. The lease operator will receive the operational information via web page, text message, fax or voice notification depending on the urgency of the information and the capabilities of the specific remote monitoring system. The production accounting function will receive the daily production data from the remote monitoring system via a download summary mechanism whose details depend on the specific software used and the operator's particular requirements. Of course the lease operator is free to visit any sites that are monitored and some operators choose the send them daily anyway to visually inspect equipment. The true power of the system is that the lease operator's trip is optional. For sites with environmental sensitivity, difficult access or high production volumes, 24 hour remote monitoring is often viewed as a necessary business practice. Each case study below will focus on one of these impact areas though most leases will have some combination of all.

The first case study focuses on an operator in the San Juan Basin. This operator has used remote monitoring for several years now on all of their wells in the area (approximately twenty). Most of the wells are producing 100 MCF of gas or less and almost all are running a small pad mounted compressor near the wellhead. Liquid production is minimal. Prior to remote monitoring, the wells would often be offline for a day or more when the site compressor stalled due to a temporary separator malfunction causing water to enter the compressor (or some similar event). The lease operator would discover this condition on their regular rounds but often at the end of the day and this was the operator's motivation for implementing the system. At the time of the cast study the operator had been using remote monitoring for about two years so we looked at production data for those two years and the two years prior to implementing the system. Remote monitoring isn't going to significantly impact a long downtime event like a parted rod string requiring days or weeks of remediation effort. The stalled compressor how ever will be back up and running on average 12 hours sooner with remote moniroing than without it. The case study attempted to separate the long downtime events from the short ones. The spreadsheet used to model these events is available at www.wellkeeper.com or by request from the author. Compared to the previous two years, the period with remote monitoring showed a 3% reduction in downtime and 4% increase in production. Despite the low production voumes the wells enjoyed about $10,000 per year increase NET OF THE EQUIPMENT COSTS and monitoring charges. In other words even in the first year when the system was installed and paid for there was a positive economic benefit. Naturally subsequent years saw an increasing benefit once the only costs were monitoring and maintenance charges.

The second case study is for an operator in the Permian Basin with approximately 200 wells. This operator chose to implement pumping by exception by installing monitoring on all the locations. The case study examined fleet costs for two years prior to and two years after installing the system. The costs included easily documented fuel and maintenance charges but did not include depreciation or time spent (or saved) on scheduling the repairs. The operator estimated a 150 mile per day reduction in driving using the pumping by exception methodology. Using this simple accounting, the operator enjoyed about a $20,000 improvement to their bottom line in the first year again net the cost of the system implementation. This operator also saw improvements in production, reduction of spills and other operational benefits but the case study focused solely on the cost savings in the truck fleet.

The third case study is for a large operator in the Permian monitoring approximately 100 wells. While seeing reduced costs and other benefits this operator focused on production increases resulting from improved access to well production data. This information allowed early detection and quick response to issues such as well loading caused by water in the formation. Using a similar methodology and again comparing data for two years prior to and after implementing remote monitoring this operator saw approximately a $1,000,000 impact net of the costs of the system.

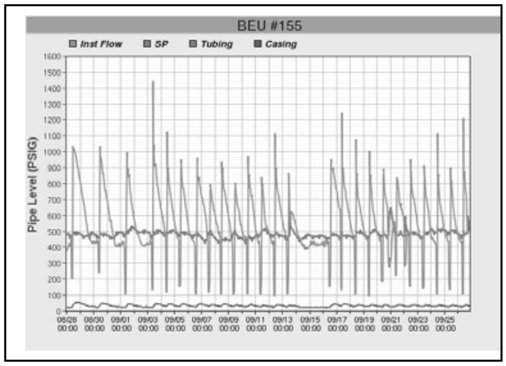
The fourth case study is for an operator monitoring approximately 100 wells on submersible pumps (ESPs) or pump off controllers (POCs). Both devices permit access to rich data streams consisting of local control parameters when monitored and this data can be easily viewed in a web browser. Using the monitoring system this operator detected a tubing leak in the well pictured below. The pressure variations coupled with the electrical parameter changes were the key indicator. Having access to the data in real time permitted prompt attention.

The use of remote monitoring is done on a case by case basis and often involves groups of wells sharing one or more of the characteristics. The significant common thread is that all show a positive net benefit with increased production or reduced costs outweighing the implementation price of the telemetry. It is in fact useful to contrast the costs of remote monitoring hardware with a more complex distributed control system which might be employed to control a large salt water disposal plant. Though there is some commonality in the use of sensors the remote monitoring system might require $5,000 to $10,000 in hardware while the control system will be two or three times as expensive.

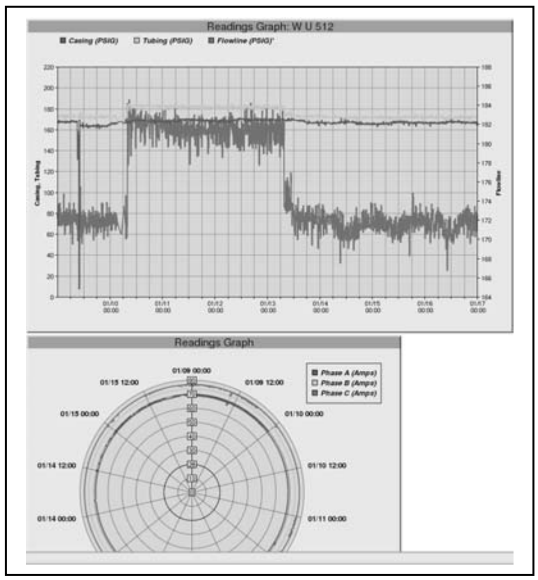
All of the operators in these studies had a variety of wells with varying degrees of production, environmental sensitivity and remote access challenges. The benefits of remote monitoring include:

1. Identifying downtime and responding faster thus increasing production and revenue
2. Minimizing spill frequency thus reducing clean up costs and reducing liability
3. The option of using pumping by exception thus reducing operating costs.

The first benefit is attractive when commodity prices are high and the last two are useful when prices are low. Remote monitoring is one of the few investments that has an attractive return in either a high or low price environment.



Gas well displaying loading



Well pumped via submersible pump with pressure and electrical variations indicating tubing leak